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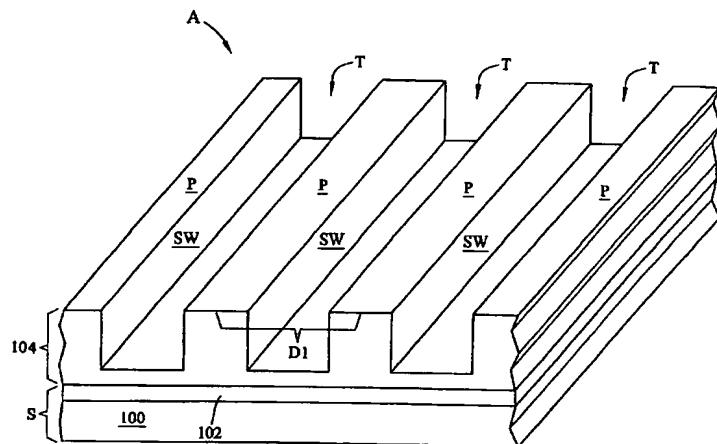
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[Continued on next page]

(54) Title: METHODS FOR NANOSCALE STRUCTURES FROM OPTICAL LITHOGRAPHY AND SUBSEQUENT LATERAL GROWTH



(57) Abstract: Methods, and structures formed thereby, are disclosed for forming laterally grown structures (104) with nanoscale dimensions from nanoscale arrays which can be patterned from nanoscale lithography. The structures and methods disclosed herein have applications with electronic, photonic, molecular electronic, spintronic, microfluidic or nano-mechanical (NEMS) technologies. The spacing between laterally grown structures (104) can be a nanoscale measurement, for example with a spacing distance (D1) which can be approximately 1-50 nm, and more particularly can be from approximately 3-5 nm. This spacing (D1) is appropriate for integration of molecular electronic devices. The pitch between posts (P) can be less than the average distance characteristic between dislocation defects for example in GaN ( $\rho = 10^{10}/\text{cm}^2 \rightarrow d = 0.1 \mu\text{m}$ ) resulting an overall reduction in defect density. Large-scale integration of nanoscale devices can be achieved using lithographic equipment that is orders of magnitude less expensive than used for advanced lithographic techniques, such as electron beam lithography.

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IPC(7) : H01L 21/338, 21/072  
US CL : 438/167; 257/194

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 438/167, 172, 180; 257/192, 194, 195, 196; 977/ DIG.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,151,757 A (Enoki et al.) 29 September 1992 (29.09.1992), Figs. 1, 4, 5, 6, and 7.	1-69
Y	US 5,838,030 A (Liu et al.) 17 November 1998 (17.11.1998), Fig. 1.	1-69
Y	US 6,242,293 B1 (Darizilio) 05 June 2001 (5.06.2001), Figs. 1, 4, 12.	1-69
Y	US 6,008,509 A (Inai et al.) 28 December 1999 (28.12.1999), Figs. 1A, 1B, 2, 3, 4.	1-69
Y	US 6,309,580 B1 (Chou) 30 October 2001 (30.10.2001)Figs. 1A, 1C, 1D, 2, 3, 4, 5A, 5B, 6, and 7.	1-69
Y,P	US 6,566,704 B2 (Choi et al.) 20 May 2003, Figs. 3B, 3C, and 3D.	1-69
Y,P	US 6,593,065 B2 (Scherer) 15 July 2003 (15.07.2003), Figs. 1a - 1d, 4, 5a-5f, and 6a-6c.	1-69
Y,E	US 6,755,984 B2 (Lee et al.) 29 June 2004 (29.06.2004), Figs. 1-5, 11a-11b, 12a-12c, and 17-19.	1-69

Further documents are listed in the continuation of Box C.

See patent family annex.

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**INTERNATIONAL SEARCH REPORT**

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**Continuation of B. FIELDS SEARCHED Item 3:**  
EAST (USPAT, USPPGPUB, EPO, JPO, DERWENT, IBMTDB)  
nano with trench; nano with width; gallium nitride or GaN; pitch; nano with width; nanoscale with pattern\$3; nanoscale near5  
lithography.